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ILLUSTRATED SCIENTIFIC NEWS
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The Pic du Midi Observatory.

EARLY in the year General de Nansouty, the hardy director of the Pic du Midi* Meteorological Observatory, was cut off from communication with the world below, the severe weather having so affected the telegraph as to prevent it from acting. Fears were entertained for the General's safety, and M. Albert Tissandier resolved to organize a party for the ascent of the Pic and the succor of the veteran observer. The snow-storm having somwhat abated at Bagnères-de-Bigorre on January 9, M. Tissandier resolved to attempt the Pic next day, in company with three of General Nansouty's usual guides.

They set out at 9 A.M., and, in spite of the deep snow and fallen avalanches, the ascent was at first not difficult. After equipping themselves for snow work at some huts occupied only in summer, the ascent was begun in earnest. The weather was gray and uncertain, the temperature 0° Cent., with a thick mist that prevented anything being seen beyond 300 metres. The snow became deeper and deeper as they advanced, and one of the guides went before to show the way, the others following the marks of his footsteps up the steep slope of the mountain side. Sometimes they were buried to the waist, and often they had to rest to recover breath. The ascent was slow and difficult, but they were often rewarded by the magnificent effects resulting from the play of light upon the snowy landscape beneath, or of the clouds advancing majestically into the midst of the snows. After attaining an altitude of 6000 feet, they had got over the steepest part of the slope. But now the weather changed, the wind rose, and mists more and more obscured the sky. Squalls of snow were driven into their faces, and seriously hindered their progress. Alongside the track heaps of snow showed where avalanches had recently fallen from the rocks above. The telegraph posts, 7 metres high, were often buried; five or six of them were even broken by the violence of the recent storms, and the wires were broken. The weather got worse as they ascended, and M. Tissandier had all the symptoms of mountain-sickness, which he had not experienced before, even when ascending Mont Blanc. At last, however, the summit was reached, and, as might be expected, General de Nansouty gave the party a warm reception. A glorious fire and an excellent dinner soon set M. Tissandier all right again.

VIEW OF THE NEW OBSERVATORY OF THE PIC DU MIDI, NOW BUILDING.

The establishment of the General is far from being luxurious, M. Tissandier tells us; although none of the usual necessaries of life are wanting, one is struck with the devotion which impels him, for the sole purpose of advancing science, to accept an existence so isolated, so primitive, and that during eight months of the year.

The observatory of the Pic du Midi is most picturesque. We enter first a passage with glass doors at the sides, in order to protect as much as possible from the violence of the wind and the gusts of snow. The telegraphic office is at the bottom. A respectable provision of wood furnishes this passage; a few hens inhabit it, one of them was slaughtered in M. Tissandier's honor. A room adorned with an immense fireplace is next presented to the visitor's view; it is the vestibule. The guides sleep here on a camp bed, and have for messmates two dogs and two cats, presided over by the intendant, the faithful guardian of the observatory. All round this apartment, carefully arranged as on shipboard, may be seen a variety of provisions. The dining-room opens in this vestibule. In summer a separate part of the building is arranged for the reception of tourists, and a stable for horses is placed below the principal structure. To the first story there is no staircase, as there is no room for it; there is only a ladder with a knotted cord as balustrade. On ascending this, a small vaulted room is entered; a stove ruddy with fire heats the whole floor, and the cold of the outside is unknown in these hospitable chambers. The chief ornaments of this apartment consist of two sets of beds, one near the floor, used by M. Baylac, the second observer and devoted companion of General de Nansouty. Above is another bed, or rather shelf, to use the General's expression; this is for the use of visitors. It is reached by a ladder, and the mattress consists of an excellent sheepskin, on which, M. Tissandier declares, he slept so soundly, 8000 feet above the sea, that he reluctantly left it on the morning after his arrival. On this first floor the General has a workroom in common with M. Baylac. This room is too small for the work which has to be done in it.

Everybody is up at daybreak; this is the inexorable order. The General then begins the day's observations. It is necessary to go outside to examine the thermometers and barometers, which are placed under a shelter constructed on a stone terrace. Every two hours, and oftener when the atmospheric conditions require it, the observations are renewed, precisely recorded, and preserved with care. Thus the whole day is passed, night alone putting an end to the work. M. Tissandier bears testimony to the energy and patience of the courageous observer of the Pic du Midi in carrying on his work. Happily the rather too primitive

(*Continued on page* 76.)

* The Pic du Midi is one of the highest points of the Pyrenees.

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Salem H. Wales. Edward H. Wales.

CONTENTS, April 1, 1879.

Calling the attention of our readers to the advertisement of our Patent Department, which appears among other advertising in the present number, we desire to say that we shall be happy to correspond or to consult with inventors or others interested in new inventions relative to any matter connected with the procuring of patents, the validity of patents already obtained, reissues, interferences, trade-marks, caveats, etc., and to make preliminary examinations when desired. All communications and consultations are held to be strictly confidential.

No list of patents appears in our present number. The lists we have been publishing were made up from the Extra Lists of Patents supplied by the Patent Office to subscribers thereto in advance of the publication of the *Official Gazette*. The publication of this list has now been discontinued, and as the last number of the *Official Gazette*, received in advance of our going to press, contains the list for March 4th, the list in our last issue is the latest which has reached or can reach us before the 23d of March, which is our usual day for going to press. The publication of the list will be continued in our next number.

A Public Loss.

It is not in any party sense that we express our regret that in the rotation of the political wheel the country is to lose, in the next Congress, the services of the Hon. Abram S. Hewitt, of this city. Mr. Hewitt is a man of irreproachable character, of liberal culture, an extensive manufacturer, and thoroughly acquainted with the vast industrial interests and resources of the country. Mr. Hewitt is also an able and ready debater, and his published speeches evince a thorough knowledge of whatever he undertakes to discuss.

The National Congress is poverty-stricken in men of this class, and it is for this reason mainly that we express our regret that Mr. Hewitt will no longer represent us in Congress.

The country suffers loss when such men are taken out of its public councils.

The Effect of Exhalations and Stenches upon Public Health.

It is getting to be more and more recognized as a fact by medical men and physiologists that the air at times teems with the seeds of deadly disease. It was formerly thought that malaria was invariably an invisible gas, vapor, or exhalation from decaying or diseased organisms or organic matter, either accompanied, or the contrary, by bad odors—more frequently the latter. Thus the peculiar faint but oppressive and nauseous odor pervading the air near stagnant ponds and swamps was once thought to be the cause of the complaint popularly known as "fever and ague." It was, however, long ago observed that intermittent fever often prevailed, or, if not prevalent, occurred, in localities remote from stagnant pools or swamps—localities considerably higher than the general level of the surrounding country, where the peculiar odor alluded to could never be detected. For a time this seeming anomaly was explained by the assumption that patients residing in such localities must have been poisoned by malaria when visiting malarious regions, or that the malaria had been carried by winds in such dilute form as to escape detection by smell, though in sufficient quantity to produce the disease in susceptible constitutions.

Slowly but surely the belief has gained a foothold that although malaria may be attended by bad odor, the stench is not by any means always the malaria, and that a fearfully bad condition of the air may exist when to the unaided senses the atmosphere appears more than ordinarily pure. Nay, it is even affirmed on good authority that exposure to certain unpleasant odors, like those arising from tanneries and soap-works, is a prophylactic against the blood-poison of yellow fever.

Many of the gases resulting from operations in the industrial arts are fetid, and, undiluted, will produce asphyxia; but it has been observed that long exposure to the diluted fumes of chlorine, carbonic acid, sulphuretted hydrogen, sulphurous acid, etc., may be, and in various occupations generally is, compatible with a fair state of health. The most deadly miasms may be such as give no warning by smell. The fatal emanations from sewers which have proved so injurious in city dwellings are in themselves nearly or quite inodorous, though their presence may in many instances be inferred by odors of gases which by themselves, however disagreeable, are comparatively harmless.

Out of the researches of those who have disputed inch by inch the in the modern times repeatedly asserted but very ancient doctrine of spontaneous generation, has accrued to medical science the most valuable of all modern discoveries: the existence, diffused through the air everywhere over the surface of the earth, of the germs of microscopic organisms. These germs are so minute that they easily find access to the circulation through the lungs; and, judging from the extreme difficulty with which they can be excluded from any space desired to be kept free from them, it is not improbable that they also gain access to the blood through the pores of the skin. There remains little doubt that these germs, under certain favorable conditions, act in the living blood in a manner analogous to ferments in organic solutions, and that this action is the basis of many, if not most, fevers, more especially those of the malignant and eruptive types. These germs are of sufficient variety to account for all the difference of symptoms by which diseases of this kind are characterized, and from which they derive their distinctive names.

It remains to determine, if possible, what are the conditions under which these germs become active in producing disease, from which determination a prophylactic treatment may possibly be suggested, and also, if possible, to discover means for destroying their activity and arresting the blood ferment, when once begun, which may be employed safely as remedies when disease has set in. The true trail having in all probability been discovered, it will be persistently followed, with a reasonable chance of success near or remote.

Meanwhile it is of the highest importance to remember that although masses of decaying and putrid organic matters or their diluted offensive effluvia may not be directly the cause of disease, they not only afford breeding-places whence the germs of disease once introduced may issue in countless numbers, but the offensive odor, by the disturbance of the nervous and digestive functions, may prepare the system for the attack. All fetid and decaying matters known by experience to be dangerous, and especially those to which disease has been conclusively traced—cesspools and the like—should never be permitted to exist in proximity to dwellings, or near wells or springs from which water is drawn for domestic purposes. Especial care should be taken in cities to avoid the pollution of air in dwellings by emanations from sewers.

The Great Walk.

Satirists vainly deride, and moralists for the present impotently deprecate, athletic games. The public taste for these exhibitions constantly increases. Especially those trials of physical strength which tax the vital powers to the very utmost appear to meet with public favor. And the reason for this is not far to seek. There is something in fixedness of purpose, even if unworthily directed, that commands respect; and these contests, however much they may be characterized by intellectual men as mere examples of physical power, are something more. The mastery of the will over physical pain and accumulating weakness, unflinching firmness in voluntary submission to the most protracted bodily strain; patience, fortitude, courage—all these admirable qualities are displayed, and few minds are so constituted as to resist the enthusiasm such traits inspire. The popularity of these games will therefore continue until the average mind is developed to a point at which it can more easily perceive the same or equally admirable qualities manifested in contests demanding other powers than strength and endurance.

Save in the one quality of will-power as applied to command of muscle and mastery of pain, the mind is educated downwards in all physical conflicts in which endurance is one of the chief factors in winning. Neither do we perceive anything but downward physical education in trials of strength and endurance calculated to tax these qualities to their last limit. The preparation for the ordeal may be most skilful and calculated to produce the highest type of bodily health and power; but what becomes of the health and power after repeated conflict? Ask O'Leary, who entered this race thinking himself "all right," but who soon found he lacked something which he possessed while performing his former wonderful feats of pedestrianism, and, wise enough to see that the something lacking was essential to the winning, thereupon abandoned the race. Ask Harriman, who, notwithstanding assertions to the contrary, can scarcely fail to come out of this race a physical wreck, even if he recover from the immediate effects of his exhaustion. Of what avail is physical training if abuse, instead of wise use of the power acquired, be its end?

But if it is clearly perceived that the moral sense is also educated downwards, how can these exhibitions of physical prowess receive the commendation of any lover of the human race? It is but just to say that a generous feeling of sympathy was manifested for each other, and a genuine hope that Harriman would be able to persevere till his gate-money was assured to him was undoubtedly entertained by the contestants. Such magnanimity, we believe, is somewhat unusual among professional athletes, and for this reason it probably challenged public approbation more strongly than it otherwise would have done. There was also much manifestation of sympathy and good feeling on the part of the spectators and the outside public. The announcement that Harriman had covered his 450 miles, and would therefore get his share of the gate-money, was received with enthusiastic huzzahs in all the theatres. This is all praiseworthy and elevating, so far as it goes; but how much does it weigh against the demoralizing effects of the betting, drinking, fighting, and jockeying that inseparably attend this kind of exhibition? Disguise it as we may, the reeking atmosphere of the arena, loaded with disgusting fumes of tobacco and rum till one end of the track was scarcely discernible from the other, was not less impure than the moral atmosphere that surrounded and pervaded the place. Into this physical and moral pollution (such is the madness of the hour) fine ladies, statesmen, and even clergymen, are stated to have plunged. What reason have we to deride the civilization of ancient paganism when, in the full light of the nineteenth century, we can rival their barbarous public games? It is, however, true that we have not yet quite reached the point of matching naked athletes with wild beasts.

When we do, we may expect to read accounts of tender-hearted women weeping at the sufferings of the slain, and—going to see the very next gladiatorial slaughter.

Some Curious Speculations—Points of Contact between Science and Theology.

THE sanitary section of the Academy of the Useful Arts was treated recently by Dr. Platt to an interesting lecture of a general character, touching the functions of the human body. The lecturer set out with the statement, which some will dispute, that "all nature teaches that the life of man and its destinies are the ultimate objects of creation." The next statement of importance was that "the first object of all the internal functions of the human body is the manufacture of blood;" which is probably unexceptionable. Another primary function of the human economy is that one to which all others are subservient, and which is known as life, mind, or the soul; for, whatever attempts may be made to distinguish between these, the effort to separate them has been a failure. Human life ought to last longer than two hundred years; with a proper observance of the laws of health men might reach the reputed ages of the antediluvians. The Rosicrucians pushed the doctrine of longevity so far as to hold that men would ultimately become immortal even in this life. A careful regard to the principle of selection produces wonderful results in some of the inferior animals, as in blood horses and cattle; even in the vegetable kingdom the sweet almond and the peach can, by cultivation, be grown from the same stock. So, by careful stirpiculture, the race of man could be greatly improved. The father of Frederick the Great of Prussia failed in producing his race of giants simply because one generation was not sufficient. Had the experiment been continued for several generations there could be little doubt of the success of the result. As it is, many of the tall men and women of Germany are traceable to the experiment. Diseases, arising, for the most part, from neglect of the laws of health, are what abridge life. Few believe that the drunkard's appetite is a disease. The mania for drink is hereditary, transmitted from generation to generation, skipping, it may be, one or two generations to reappear in a following one. Happiness is essential to health. As to the relation between mental and bodily phenomena, medical schools now recognize the science of psychology, which investigates the actions and manners of that unseen energy which animates and controls the human machine, namely, life, soul, mind, vitality, or whatever it may be called, termed in Greek ψυχη, or soul. If this essence be immortal, why should there be a doubt that it should be able to see and contemplate its fellows here?

Mr. Nieman: "Human nature seems to go by the laws of contrariness. The more anxious we are to preserve our health the more sickly we get."

A Voice: "Abolish the doctor."

Mr. Nieman: "Some say that would be a good cure. (Laughter.) Besides, who dares pretend that he knows the laws of Nature? If there be any law, it is the law of liberty whereby Nature claims to do as she pleases." (Applause.)

A Gentleman: "If you close the room and shut off the air you will soon know what a law of Nature is."

Mr. Nieman: "But there are plenty of creatures could live in it then."

The Gentleman: "If so, I never heard of it."

Dr. Sheppard remarked that it is only the race of man that seems to violate the laws of his nature at every turn of life. It is a curious question, leading to the question of the origin of evil and to the further question of what man's nature is. Man at all stages of his life is surrounded by enemies. There is poison in the atmosphere, in the water, in every part of the animal and vegetable world, and even the healthy animals and vegetables are subject to disease. Man has to fight his way through all these evils. The worst of all the poisons is the poison of sin, error, folly, in his own organization. He (Dr. Sheppard) did not believe in total depravity, yet it was very plain that, as a matter of fact, man was depraved in all the elements of his being. His mental nature is very confused. As to his moral nature, one indication of it is the fact that he is the only creature that systematically preys on his own kind. Other creatures occasionally do so to satisfy their necessities; but such is the moral nature of man that he robs and outrages his fellowmen at every turn of life. The world is filled with the records of murder, massacre, and persecution. To sum up, man is, as a matter of fact, grossly depraved. A large part of the ills to which he is exposed are inevitable. If the white man goes to the tropical regions, the difficulties in his way are of such a nature as to produce a tendency to run out his race. Similarly, if he moves to the polar regions, he becomes stunted and cold-blooded, with a tendency in the same direction. "In fine," continued the doctor, "we have a hard road to travel. We have to accumulate wealth to put us over the winter, etc. As to the original account of the falling of man into sin—"

The Chairman: "I'm afraid you are wandering too far, doctor, raiding into the field of theology."

Dr. Sheppard: "The gentleman who lectured set the example. However, I do not propose to go farther in that direction, but you will see my purpose in a moment. It is plain from the Bible account that sin came into the world simultaneously with the wearing of clothing. The first people when they became sinners wore aprons merely, but the garments became afterwards more extended. This is a very remarkable fact—the introduction of sin simultaneously with the wearing of clothing. The application is this: The human skin is really a breathing surface, and the most complex organ of the body. Dr. Wilson reckoned 3500 pores in a square inch of the human hand. About 2800 is the average number of pores to every square inch of skin. Every pore is a little tube about one eighth of an inch long. The total number of pores in the entire human skin has been set down as about 7,000,000. If these pores or little tubes were placed in a line continuously, they would form one tube something like 20 miles in length. The stoppage of these pores gives rise to sickness; hence it is most natural that man should have his skin exposed to the atmosphere in order that they may be kept open and in exercise. A gentleman of his (Dr. Sheppard's) acquaintance, who had come from New Zealand to California, had told him that he stopped for some time *in transitu* at Summer Island, one of the islands of the South Pacific. More childlike or innocent people he had never seen than he found on that island. The old people seemed to possess all the simplicity of childhood. All the clothing they wore was a garment round their waists. The thermometer ranged there from sixty to eighty degrees; they had no need of more clothing, no need of houses, no need of accumulated wealth. They had the bread-fruit tree, their oyster-beds close at hand, every thing they wanted almost without an effort. There was no selfish or grasping disposition to be found among them; there was no occasion for it. Putting this account side by side with the Bible record of creation, and with the fact that sin commenced with the wearing of clothing, we may suppose that the so-called Paradise was a condition of things similar to that existing on Summer Island, and that a change of climate made clothes necessary and was the external cause of sin."

A Gentleman: "It would seem, then, that going naked and having nothing to do is Dr. Sheppard's beau-ideal of a happy life. I, for one, do not believe that such is man's destiny."

Dr. Sheppard supplemented his previous observations by remarking that sunshine and light were necessary to health. They had all heard of the blue-glass furore that raged some time ago. Dr. Sheppard had found a great many people relieved by the sun-bath. If people would expose their skin as much as possible to light and air and observe cleanliness, they would save themselves from half the diseases to which they are liable."

The Bisulphide of Carbon Question—A Contradiction Contradicted.

BISULPHIDE OF CARBON IN THE MANUFACTURE OF RUBBER.

IN our last issue we felt obliged to repeat the statement formerly made by us that bisulphide of carbon is not used in the manufacture of vulcanized rubber. Our reiteration was called forth by remarks of Dr. Parmelee, an able chemist, before the New York Academy of the Useful Arts, where he said the SCIENTIFIC NEWS was wrong in making such an assertion. At the last meeting of the Academy, Dr. Parmelee again contradicted our assertion, and stated that during the last two years he had received a percentage on 62,400 lbs. of bisulphide of carbon used for the vulcanization of rubber in the United States alone. He added that bisulphide of carbon is necessarily used in a class of vulcanized goods for which Goodyear's rubber would not answer. For instance, for fine, soft, elastic tubing, Goodyear's rubber would not be suitable, and bisulphide of carbon must be used.

Further inquiry upon this subject reveals a confusion of mind regarding what constitutes vulcanization. Some apply this term only to processes wherein free sulphur is combined with the rubber by the aid of heat, while others in the trade apply it to all processes wherein sulphur is combined with rubber, whether dissolved in the oil of turpentine, combined with carbon, as in the bisulphide of carbon, or presented to the rubber in the free state and the combination affected by the aid of steam or other heat. In the manufacture of a class of articles, such as toy balloons, finger cots, thin sheet rubber, and others named by Dr. Parmelee, bisulphide of carbon is used, but in the trade we find these articles sold under the name of "pure rubber goods." The difference of statement appears to have arisen from a confusion of terms in the trade, the manufacturers who gave us the information not understanding the articles named by Dr. Parmelee to be vulcanized rubber.

Proposed New System of Rapid Transit for Cities.

WE are informed that a movement towards forming a company for the introduction of a new system of rapid transit is on foot in Brooklyn.

The system proposed is a radical departure, being no less than the substitution of sliding stock for rolling stock, in all except the locomotives. The kind of locomotive best adapted to the purpose has not been as yet definitely decided, and it is quite possible that locomotives may not be used at all, their place being taken by stationary engines and traction ropes.

So wide a departure from ordinary railway practice may seem to many as an inventor's chimera, but upon consideration the seeming impracticabilities disappear, or dwindle into practical difficulties which at most seem not greater than were at first encountered in the adoption of our present railway system.

It may be assumed that the question of propulsion for sliding cars has been already solved, many methods already existing which would effectually serve the purpose.

The problems to be solved are to construct a permanent sliding way and so lubricate it that the coefficient of friction shall not too greatly increase the fuel account, to find a system of lubrication that shall not be objectionable on account of its uncleanliness, and to so construct the permanent way and sliding runners or trucks that curves may be passed with ease and safety.

It is claimed that the projectors of the system have devised a method of lubrication which answers both purposes sought, and that a solid lubricant (the nature and mode of application we are not at present at liberty to state) may be adopted.

Could a system of sliding cars, with local traction engines in place of locomotives, be rendered practicable, the advantages over the present system of rapid transit on our elevated roads would be immense. The at present almost intolerable nuisances of noise and dust would be nearly or quite removed. It is not to be expected that the coefficient of friction can be so largely reduced that sliding cars can be run as cheaply as the present rolling stock. What the precise ratio of economy will be can only be determined by experiment, but exemption from the nuisances of the present system would be cheaply purchased by a considerable increase of the fuel account.

It would be interesting to see a short section of such a road put up and operated as an experiment, and, if we are correctly informed, this is likely soon to be a *fait accompli*.

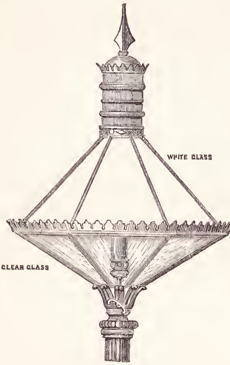
The inventor of this system is Mr. E. W. Pitman, of No. 48 Stanhope Street, Williamsburg, N. Y.

FOLLY OF TRADES-UNIONS.—One of the largest machinists in England recently purchased a valuable invention for making railway, carriage, and other springs by machinery, but his workmen positively refused to avail themselves of it. It ended in his sending the contrivance to Belgium, together with suitable material, and the springs are actually made there and returned to England.

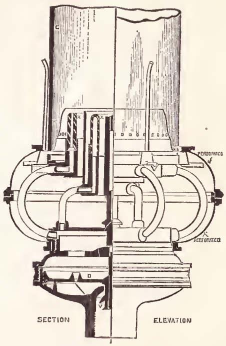
(*Continued from page* 73.)
arrangement of the General will soon be changed for the better, thanks to the generous donations of those who love and desire to advance science.

During the small amount of leisure which can be found between the hours of observation, General de Nansouty directs his companion in a great variety of labors. A very interesting herbarium of the flora of the higher regions of the Pic du Midi has thus been formed. Traps are also laid by M. Baylac, and thus a fine collection of ermine skins has been formed.

The guides repaired the damage to the telegraph which had interrupted the General's communication for ten days. M. Tissandier says rigthly that these accidents should not be allowed to happen to a man who so generously devotes himself to the progress of a department of science that is of the greatest national utility. For at least a part of the distance between the summit and the plain the wires should be placed underground, and thus beyond the reach of injury from avalanches and storms. After M. Tissandier's visit telegraphic communication was again interrupted with the Pic. M. Tissandier bade the General good-by on the 12th, and during his descent took several sketches. While it took him nine hours to make his ascent, he came down in four.



SUGG'S GAS-LAMP.



LONDON ARGAND GOVERNOR BURNER.

Sugg's Gas-Lamp, with London Argand Governor Burner.

In a late issue we published the opinion of a London contemporary—*Nature*—that, as the electric light was not meeting the expectations which had been raised in the public mind regarding it, it would be worth the while of the gas companies to attempt what could be done by way of improvement in gas-lighting. The journal referred to also made mention of an experiment in this direction. We herewith present to our readers engravings and a description of the gas-lamp alluded to, which seems to have been successfully employed for street-lighting in the English capital. The location where these lamps have been substituted for those formerly used is Waterloo Place, and a part of Regent Street. Thirty-six of the Sugg's lamps have replaced a like number of the old ones, which each gave a light of nine candles with a consumption of $2\frac{1}{2}$ cubic feet of gas per hour. Each of the Sugg's lamps consumes 19 cubic feet of gas per hour, and gives a light of eighty candle power. The new lamps therefore give an increase of light of $\frac{5}{9}\frac{4}{5}$ candle power per cubic foot of gas consumed. This does not appear a very great gain in economy, being probably not a greater difference than may frequently be observed between new and old gas-burners of almost any particular type. The total amount of light produced by a Sugg's lamp is, it appears, only about nine times as much as is obtained from a burner of the kind heretofore used. We are not informed of what type the old burners were, but judging from the ordinary cost of burners in common use, and what it would appear the London Argand Governor Burner must cost, on account of its more complicated construction, the difference in first cost between nine of the old and one of the new burners will not be greatly in favor of the innovation.

In vertical section the lantern is approximately diamond-shaped, and it is hexagonal in plan, with the exception of the two largest and the four of intermediate size, which are respectively 12-sided and octagonal. The upper portion of each lantern is glazed with a new kind of white glass, which serves to reflect as well as to transmit the light. The lower portion is of clear glass, which allows the reflected as well as the direct rays to be distributed around, and such is the arrangement of the framing that no shadows are thrown on the ground immediately under the lantern, as with the ordinary street lanterns. The ventilation of the lantern is very perfect, and is such that a high wind does not affect the steadiness of the gas-flame. The burners are so arranged that they are self-lighting upon the gas being turned on. To effect this, each burner is fitted with a central jet of gas, termed a flash-jet, which burns a quarter of a cubic foot per hour, and always remains alight. This little jet is maintained at a constant rate of consumption by a small governor of very ingenious construction, which Mr. Sugg has recently devised. Each of the large burners is also provided with a governor, so that variations of pressure in the street mains do not in the least affect the height of he flame. Each lamp is provided with a lever tap, so arranged that the gas can be turned on and off without the use of a ladder. When turned on the small flash-light ignites the gas, and when turned off the "flash" remains burning, there being thus no necessity for opening the lanterns to light the burners, notwithstanding that they are of the argand type.

The general construction of the lamp will be well understood from the engravings, which respectively exhibit an exterior view of the entire lamp and an enlarged sectional view of the London Argand Governor Burner.

Machine Watchmaking in the United States.*

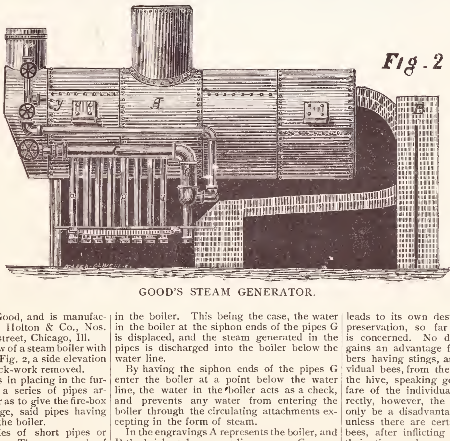
The idea of making watches by machinery is due to Allan Dennison and Edward Howard, two working watchmakers of Boston, who established a small shop at Roxbury in 1850 to carry out their views; but finding that the noise and dust of a populous town interfered with their success they removed to Waltham, ten miles from Boston, and in 1854 built a factory on a beautiful site of unimproved land close to the Charles River. The enterprise, although successful in producing excellent watches, became a financial failure, and in 1857 the property was purchased by Mr. R. E. Robbins, who established the American Watch Company, with a capital of \$200,000, which has been increased to \$1,500,000. Since then the business has prospered, and now provides employment for about 800 workpeople. The factory comprises a double row of light, airy buildings, two and three stories in height and about 300 ft. long, which are connected transversely by other buildings, and all are surrounded by large grounds neatly kept, in garden and lawn; two small steam-engines supply the motive-power, and the machinery, which was all invented and constructed on the premises, consists for the most part of automatic and semi-automatic tools, of the most ingenious and delicate construction, many of them apparently more complex than the watches whose parts they make with such nicety and exactness. There are nearly 1200 different machines besides duplicates, and very minute pieces of work require many different machines to perfect it—for instance, more than 120 different machines are used to form and perfect the escapement. All the parts of the watch, including the main-spring, hair-springs, etc., are made in the factory, and there are rooms for gilding, burnishing, and enamelling. The brass and copper of which the watch-plates, etc., are made are rolled at Waterbury, in Connecticut. Heretofore all steel used in the factory was imported, but now American steel supersedes it to a great extent, and the precious stones, enamel, etc., are bought in the London market. The division of labor is almost carried to the extreme; a large number of the hands work many different machines each, and there are seven automatic screw-making machines, all tended by one man. Each of the machines produces 3000 minute screws of various sizes per day from the pin of wire, and each screw is complete with thread, head, and slot. It will take 200,000 of the smaller screws to make 1 lb., and this factory now supplies nearly all the screws required for watch repairs throughout the country. Nearly 90 per cent of the *employés* are Americans, chiefly natives of the New England States; and one cannot fail to observe that they are all people of respectability and intelligence, and that care is taken that their work is done under pleasant and healthful conditions. More than half the operatives are males, and the chief part of the skilled hands employed were brought up to the trade of watchmaking or as machinists, but the bulk of the ordinary hands who tend machines, etc., were new to the business. All the work is done by the piece as far as practicable, and about three fourths are so employed. The hours of labor are from seven o'clock A.M until seven o'clock P.M.; an hour is allowed for dinner, and only nine hours are worked on Saturdays. The skilled watchmakers and machinists earn on an average about \$3 a day. The operatives who tend the machines earn from \$2

* Condensed from a communication to *Design and Work*, by Mr. Thomas Connolly.

to $2.25 a day, and the women earn from 90 cts. to $1.60 a day. The monthly pay-roll is about $51,000, and 12,000 oz. of silver are used every month for watch-cases. The company owns 100 acres of land, the greater portion of which has been cut up into building lots, on which they have erected buildings for the accommodation of their employés. Many of the operatives have built houses for themselves and families on the company's land, some of which are very neat and even elegant residences, commanding a fine view of the Charles River and a beautiful chain of hills which skirts it on the west. The general feature of the Waltham watches is the English lever, without fusee and chain, and the cardinal principle of the company is to make it as simple as possible, and sound and perfect as a machine, only looking to the use of the watch as a timekeeper. The watches vary in size and quality, from the delicate and elaborately-finished ladies' watch to those put into 6 oz. silver cases for the use of the miners in the Far West. A large number of railroad officials in this country are supplied with Waltham watches, and the Indian Government some time ago ordered a supply of those watches for railroad officials in that country. Last year the factory produced 50,000 silver watch-cases, and made about 375 watch movements daily; and the entire production since 1858 has been over 1,100,000 watches. The chief market is in the United States; but of late years the goods have rapidly extended to foreign markets. The London agency alone sold 23,040 movements last year, and large orders for movements are received from watch-makers in other countries, which are put into cases of their own make. The chief feature which distinguishes the work of the Waltham factory from European work is that each part is, as it were, a separate branch of manufacture, all being combined in the assembling-room—a system which the Americans very generally adopt in manufacturing where practicable to diminish the cost of production. As before stated, one man in a given time will now produce nearly three times as many pairs of boots and shoes as had been done thirty years ago by one person. And in the Waltham factory, with the aid of machinery, the labor of one man is equivalent to the production of 150 watches annually; whereas in England and Switzerland only 40 watches per annum are produced by each man employed in the trade.

Good's Steam Generator.

It is well known that great difficulties have been met in the attempt to construct steam generating apparatus having a portion of the heating surface within the fire-box, in such manner as to maintain a full and thorough circulation and supply of water to the interior of parts so located. The difficulty has arisen from the action of the intense heat, which, by the rapid evolution of steam, drives the water out faster than it can be replaced. This difficulty has been found to be greatest in boilers wherein a compound construction of plain cylinder or locomotive type and steam generator in the fire-box, has been sought to be carried out.



GOOD'S STEAM GENERATOR.

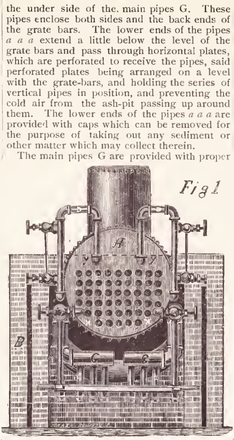
The invention which forms the subject of this article is claimed to be a full solution of this problem. It is the invention of Mr. E. G. Good, and is manufactured by Messrs. C. C. Holton & Co., Nos. 303 to 309 South Canal street, Chicago, Ill.

Figure 1 is a front view of a steam boiler with the fire-front removed; Fig. 2, a side elevation of the same with the brick-work removed.

The invention consists in placing in the furnace of a steam boiler a series of pipes arranged in such a manner as to give the fire-box the appearance of a cage, said pipes having proper connection with the boiler.

a a a represent a series of short pipes or tubes arranged vertically. The upper ends of these pipes are inserted at regular intervals in the under side of the main pipes G. These pipes enclose both sides and the back ends of the grate bars. The lower ends of the pipes *a a a* extend a little below the level of the grate bars and pass through horizontal plates, which are perforated to receive the pipes, said perforated plates being arranged on a level with the grate-bars, and holding the series of vertical pipes in position, and preventing the cold air from the ash-pit passing up around them. The lower ends of the pipes *a a a* are provided with caps which can be removed for the purpose of taking out any sediment or other matter which may collect therein.

The main pipes G are provided with proper



GOOD'S STEAM GENERATOR.

valves for closing the connection between the boiler and the heating and circulating attachment.

The main difficulty to be overcome in a device of this nature is to be able to keep up a continuous and regular circulation from the point at *x*, where the water passes from the boiler into the pipes enclosing the combustion-chamber until it is again returned to and discharged into the boiler at *y* in the form of steam.

It is evident that the water in the pipes will be converted into steam more rapidly than the water in the boiler. The effect of this will be to increase the pressure of steam in the upper ends of the pipes G over that of the pressure in the boiler. This being the case, the water in the boiler at the siphon ends of the pipes G is displaced, and the steam generated in the pipes is discharged into the boiler below the water line.

By having the siphon ends of the pipes G enter the boiler at a point below the water line, the water in the boiler acts as a check, and prevents any water from entering the boiler through the circulating attachments excepting in the form of steam.

In the engravings A represents the boiler, and B the brickwork surrounding same. G represents the water-feed pipes, the lower end of each of these being inserted in the front flue-sheet of the boiler at X. These pipes are then conducted back from the front of the boiler, passing between the boiler and brick walls, enclosing same, until the point is reached where the bridge-wall is located; then taking a downward direction until about four inches below the bottom of boiler; thence running transversely towards the opposite sides of the furnace, nearly meeting each other at the centre; thence returning and extending horizontally to the front of boiler, as shown in Fig. 2, and taking an upward direction until about six inches above the top of boilers; then bending across and downward to form the siphon as shown in drawing, each end being inserted in the front flue-sheet at Y, below the water line.

By this arrangement it is claimed that the water in the boiler is constantly passing into the pipes and is returned to the boiler again in the form of steam, and this continued agitation of the water is calculated to prevent the deposit of sediment upon the flues and boiler-sheets.

No sediment can lodge in the horizontal and vertical pipes above the grate-bars. The great rapidity with which the steam is produced (all the water being thus heated in detail) insures a powerful current through the tubes, so that whatever sediment is caused by the downward flow of water in the vertical pipes is immediately expelled by the upward flow in the same, owing to the great heat to which it is immediately subjected in consequence of its proximity to the flames. In practice, it is said, no difficulty whatever has been experienced in this respect, the tubes when examined being perfectly free from sediment above the line of the grate-bars.

The device is applicable not only to tubular boilers like that shown in the engraving, but also to marine or locomotive boilers, and may easily be attached to boilers whose capacity for steam production has been found too limited for the work required of them.

The manufacturers make the following claims for the utility of the improvement, which claims they assert have been fully demonstrated by use, to wit: a large saving in fuel, a very large daily saving in time for getting up steam and an increase of working capacity of a boiler of the ordinary types of nearly fifty per cent. They maintain that there can be no question as to durability, for experience having shown that the circulation of water being constant through the pipes, they will not burn out any more readily than the flues of a boiler. It is probable that very many boilers now found of too small capacity might be retained by the aid of this attachment, and at a far less cost than that required to supply a new boiler. The cost of the device and its attachment to boilers in use is, we are informed, very low in comparison to the increased capacity and economy secured.

Bees' Stings. — A writer in *Nature* has called attention to a singular but well-known fact which demands explanation from advocates of the doctrine of evolution, to wit, the imperfection of a bee's sting as a weapon of defence. For purposes of self-defence it is apparently worse than useless, for in nearly every case, almost without exception, the bee lays down its life with the sting. The possession of a sting therefore only leads to its own destruction instead of to its preservation, so far as the individual bee is concerned. No doubt the hive generally gains an advantage from all its active members having stings, and so indirectly do individual bees, from the fact that the welfare of the hive, speaking generally, means the welfare of the individuals that compose it. Directly, however, the possession of a sting can only be a disadvantage to the individual bee, unless there are certain enemies from which bees, after inflicting a wound, can withdraw their stings and escape with life. This appears unlikely, and therefore no bee can have any

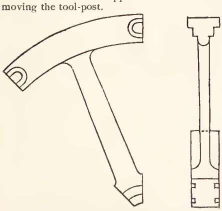
knowledge from experience of what a weapon of offence he possesses, for he has never used it, nor can he have knowledge from experience of the consequence of using it. All smaller pests bees attack with their jaws. Is it possible, then, that they are so intelligent as to be well aware of the power for mischief to themselves as well as to others which they carry about with them, and that it is only when they altogether lose control over themselves, either through severe pain or through terror lest their queen should be injured that they sign their own death-warrants on our hands and faces. In the death of a few worker-bees a hive suffers very little loss, perhaps none at all; yet it may have gained much in the shape of security from molestation Are bees so intelligent as to know this fact, and communicate it from one to another, or can their conduct be explained on the lower ground of instinct? Is the fact that the sting of the worker-bee is an imperfect weapon of defence a result of its having nothing to do with the propagation of its species, this being left to the stingless queen and drones? Consequently any tendency to develop a more effective sting in one generation of worker-bees has no hereditary effect on succeeding generations, nor apparently have the worker-bees any influence whatever on the worker-bees that succeed them, except by the way in which they feed and educate them, unless, indeed, they can impress their tendencies on the drones or on the future queen before she leaves the hive. Finally, are there any other insects unable to defend themselves without more self-injury than they can inflict upon their enemies?

Fly-Wheel for the Pembroke Iron Co.

A fly-wheel eighteen feet in diameter, weighing 48,000 lbs., having been constructed by the writer, for the Pembroke Iron Co., he submits the following description for publication: A fly-wheel of the weight mentioned was wanted to regulate the motion of a sixteen-inch train of rolls, to be driven by a sixty-inch Turbine water-wheel, built by the Humphrey Machine Co. of Keene, N. H., and the writer was authorized to construct one. The pattern was made by the Boston Machine Co., from drawings by the writer, in one piece, comprising one eighth of the rim, an arm, and one eighth of the hub, of the following dimensions: Rim, fifteen inches square; arms, oval, five inches by ten inches at the rim, and six inches by twelve at the hub, and joined to the rim by fillets of five-inch radius; the inner end of the arm being enlarged by additions to a width, which on a radius of three inches makes one eighth of a circle, also by additions to the sides, at a radius of fifteen and ten inches, of two and three inches respectively, making the length of the hub seventeen inches. The radius of the hole for the shaft was five inches.

The weight of the sections was limited by the capacity of the furnace used for melting the iron, and averaged five thousand nine hundred pounds.

The sections were cast with the usual allowance for finishing on the ends of the rim, also at the hub, and were brought alongside of a small planer and bolted to brackets fastened to the bed of the planer. An upright slide was made to stand on the platen of the planer, and the tool-post of the planer was placed on it, and the feed motion was given by a star-wheel on the upper end of the screw moving the tool-post.



The section was then levelled and the end of the rim planed to gauge; then the upright was moved to the other end af the platen, and the face of the joint at the hub planed. Owing to the shape of the sections and the position of the planer, it was then necessary to turn the section over to finish the other face. This was done by placing suitable blocking under the rim and raising the arm to an erect position, then milling it around and lowering the arm down again, when the other face was planed. When all the sections were planed they were moved to a place near the pit intended for the wheel, each section being weighed on the way, and placed in a circle on suitable blocking at a convenient height, in a horizontal position, care being taken to place those of nearly equal weight opposite each other.

Three sections were then fastened permanently together by links of two-inch square iron, six by twelve inches inside, let into suitable pockets cast in the sides of the rim. These links were put on hot, and allowed to *shrink* to their places. Then two sections each side of the group of three were permanently fastened together, leaving one section by itself. When the sections were brought in close contact it was found that the planing had been so accurately done that but little filing and scraping were necessary to make the joints pinch paper in all parts.

After the planing had been corrected, temporary links were put on the remaining joints and rings, on the projections on the hub, binding the whole firmly together.

A boring bar was then put through the hub, and suitable bearings, one above and one below the wheel, provided. A sweep was then attached to the upper end of the bar, by which the bar was centred in the hole, and by which two men applied the power for boring out the hole, using the rim of the wheel for a track. In boring the hole the bar, carrying a single cutter, revolved in the bearings, and was fed upward by a screw. When the boring was completed the temporary bands were cut off and the group of three sections set up on the periphery and the keyway cut. Then these were moved over the wheel-pit and lowered half-way down by jackscrews. Then the two section groups were brought along and hoisted into place, and the shaft put in; and lastly, the single section was hoisted into place. The remaining permanent links were then put on, and the rings on the hub. The thirty-inch rings being of two-inch square iron, and the twenty-inch rings of two and a half inch square iron, all being shrunk on. The wheel was then lowered into place, and it was found that, notwithstanding the rough castings, it was less than half an inch out of truth. The wheel has been run 112 revolutions per minute, though the usual speed is from 85 to 90 revolutions. No accident occurred in handling any of the sections or the wheel when completed.

It will be seen that there are no holes in the wheel, neither bolts nor keys to be fitted; but the work, with the exception of one skilled mechanic and blacksmith, is such as can be done by laborers and with limited facilities. The planer used planes only six feet in length.

E. S. Chapell.

Pembroke, Me.

Cowper's Electric Writing Apparatus.

In our last issue we gave a fac-simile illustration of the writing produced by this very ingenious device. We herewith take the earliest opportunity of placing the details of the invention before our readers, the description and engravings being reproduced from *The Engineer*. We are by no means of the opinion that the invention will supplant apparatus now in use for telegraphic communication, but the probable or improbable utility of the invention neither adds to nor detracts from the scientific interest of a remarkably ingenious application of electrical forces to writing at long distances.

Suppose two series of small metallic plates, placed at right angles to each other, and each series connected by means of a line wire to a similar series at a distance. Sliding on the top of a series, suppose a metallic plate large enough to touch two or three or more of the series as it passes over. Each member of the series is to be insulated from its immediate neighbor, and connected to line by wires of different resistance. If now by means of this sliding disk we connect the line to a battery, a current goes from the battery through the disk, through the plates it touches, and through the connecting wires into the line, and the current increases or diminishes according as the disk touches more or less of the plates with less or greater resistance between them and the line. Similarly with the second series of plates and the second line wire. The series at the receiving end being similar to those of the sending end, it will at once be seen that variations of electrical force can be obtained. The two sliding disks can be rigidly connected to a pen, and on motion being given to the pen, motion is given to the disks, and variations of current immediately commence in each line. These variations of current produce variation of force in eletro-magnets at the receiving end, and if these electro-magnets act on a body the effect varies. All this Mr. Cowper actually does, and, simple as it now seems, great credit is due to him for having shown us the best way to produce an electro-writing telegraph.

FIG 1

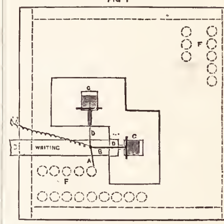
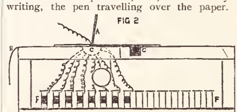


Fig. 1 is a plan of the sending instrument, Fig. 2 being an elevation of the same. The writer holds the pen, which is rigidly connected to the travelling contacts, and also as shown at A A^1, to the batteries. The slip of paper on which the message is written is moved somewhat in the same way as in a Morse instrument; in fact, the Morse clockwork can be easily used for the purpose. Thus the paper travels under the pen instead of, as in ordinary writing, the pen travelling over the paper.

FIG 2



Two sets of thin metal plates B B form the contact apparatus; D D are the light connecting rods, the ends of which make contact with the plates; F F are the resistance coils connected to the contact plates, one coil for each plate, except the first of the series, which is connected direct to line. It will be noticed that the strength of the current entering the line depends upon the plate with which contact is made by the connecting rod. As the rod travels from the first of the series the resistance increases, the current having to pass through $n - 1$ resistance coils, as well as the line wire, n being the number of plates from the first of the series to the point at which contact is made. Generally, however, as one contact piece travels from the first of the series, the other travels towards the first of its series, and thus, while the current decreasingly varies in one line, the variation is increasing in the other. A slight knowledge of co-ordinate geometry will enable the student to plot the curve of any letter, and to calculate the variations in the

FIG.3.

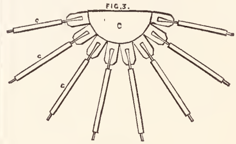
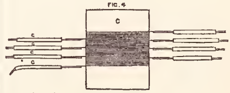


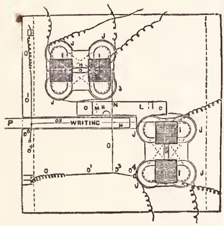
FIG.4



strengths of the currents. Figs. 3 and 4 show respectively an elevation and plan of the thin

metal plates, which are insulated the one from the other by paper soaked in paraffin. The receiving instrument, shown in plan and elevation in Figs. 5 and 6, differs from the sending instrument; *H H* are light soft iron bars on delicate bearings, having the ends surrounded by the coils *I I*, to which the bars form a movable core. Through these coils the varying currents of the line are sent, which, of course, have a varying action on the core. *J J J J* are four permanent or electro-magnets, between the poles of which the coils just named

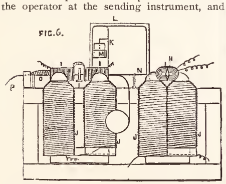
FIG. 5.



are placed; *K* is a siphon pen. Mr. Cowper prefers, but does not restrict himself to the use of, the well known siphon pen of Clark. The pen is adjustable from the bridge *L*, and the ink reservoir is shown at *M*. The light connecting rods *N N* transmit the motions of the movable cores to the pen; *O O* are springs to enable the pen to resist the pull of the magnets; the connections are shown in O^1 O^2 O^3, the latter being attached to a fixed post O^4.

As the currents sent through the line wire by the sending instrument vary in strength or power, and cause the light bar of soft iron to move with varying power by its attraction to the stationary magnets; and in order to cause it to take its proper position according to each variation in power, a varying resistance is opposed to it, such as a spring which requires more power to compress it the more it is compressed, that the action of the soft iron bar, combined with that of a precisely similar bar actuated by the second line wire will cause the position of the pen in the receiving instrument to follow the position of the pen in the hand of the operator at the sending instrument, and

FIG. 6.



thus form the letters. The total strength of the spring or varying resistance can be regulated at will, so that the letters formed by the pen shall be of the same proportionate height and width as the letters written by the operator at the sending instrument. One convenient way of applying the varying resistance to the light bar of soft iron is by placing a very light spring to pull at the end of the bar in the direction of its length, but allowing of the motion of the bar, which will thus cause the spring to act with more and more leverage as it moves more out of line with the spring. When so arranged there is required another spring to keep the connection with the pen tight, if such connection is flexible, so that the pen may go backwards as well as forwards over the paper, as the light bar of soft iron moves either one way or the other. But the spring or variable resistance may be made to act both to give the increasing resistance and the power to draw back the pen as well, if the spring is made to pull by a flexible or jointed connection at a fixed point, the line of such pull being parallel, or nearly so, to the light bar of soft iron, while another rigid or flexible connection from the end of the bar to the connection to the spring has the pen attached to it at about the middle of its length, which arrangement will give the same result as the two springs before described.

Monster Ferry Steamer for the Central Pacific.*

There is being constructed at the shipyard of the Central Pacific Railroad Company, at Oakland Point, under the superintendence of Arthur Brown, a mammoth steamer which is intended for the carrying of freight and passengers across Carquinez Straits, when the new arrangements contemplated by the railroad company go into effect, which, among other great improvements, includes the transportation of overland freight and passengers, via. Sacramento and Suisun, to Benecia, to Carquinez Station, to Oakland wharf, and *vice versa*. This floating bridge, for such indeed it is, will be 425 feet in length, on deck, over all, 116 feet in width over all, and 18 feet depth of hold. She will be provided with four tracks, running her entire length, of capacity sufficient for 48 freight cars, or 24 passenger cars. The main deck, upon which these tracks will rest, will be trussed, bolted, and fastened together so as to give unusual strength. In work of this character, heretofore, simple stanchions have been used, but in this the trussing underneath the tracks will render the superstructure as durable as granite and as strong as iron. In the construction of this boat 1,500,000 feet of lumber will be used, many of the timbers ranging from 80 to 115 feet in length, 24x25. Some of this timber is magnificent in proportion and finish. The new steamer has four balanced rudders at each end; and the steering gear, as well as the capstans, are to be worked by steam. The boilers are eight in number, and are to be of the best Otis steel. Each boiler will be 27 feet 10 inches long, the shell 7 feet in diameter, and the furnace end 8 feet. Each boiler will weigh 21 tons, and the eight will aggregate 168 tons. Each sheet of the steel used in these boilers is to weigh 1285 pounds, being three eighths of an inch thick, with a tensile strength of 60,000 pounds per square inch. There will be 143 tubes in each boiler, 4 inches in diameter by 5 feet 11 inches in length. Total heating surface of the eight boilers, 19,-640 square feet; steam room, 2715 cubic feet; water room, 3000 cubic feet, or 25,000 gallons of water; weight of water, 225,000 pounds. There are to be four steam drums, 17 feet long and 5 feet in diameter, and four smoke stacks, 40 feet long and 4 feet 9 inches in diameter. It is intended that there shall be no delay in making the transit across the straits, and locomotives as well as cars will be run on the tracks. There will be a restaurant on the steamer for the convenience of the hands, as well as a cabin for the same purpose; and outside of the pilot houses the entire room in the structure, except where the engines are placed, will be for the transportation of cars. The steamer is to be provided with two vertical-beam condensing engines, with 60-inch cylinders, and 11 feet stroke. These engines are to be placed in the centre of the boat fore and aft, 8 feet apart, which is done for the purpose of gaining deck room. This idea has not always met with complete favor, but those who profess to know are well assured that the innovation will be entirely successful. The shafts will be 22 inches in diameter and 52 feet long; wheels 30 feet in diameter, with buckets 17 feet by 28 inches. The machinery will weigh about 500 tons. This boat will cost upward of $350,000, including the engines. She will be a monster in size, a model in construction, and a giant in service.

The Iron Ocean Pier at Long Branch.

Work upon the great pier and breakwater, which are to convert Long Branch into a seaport and an accessible summer resort for New Yorkers, is progressing rapidly.

Long Branch is a favorite seaside resort for the wealthy citizens of New York and Philadelphia. It lies on the New Jersey coast twenty-eight miles south of this city; and the only obstacle to its becoming as noted and popular a bathing place as Coney Island or Rockaway, on the southern shore of Long Island, has been the lack of a landing place. This want is now to be supplied by building a pier straight out into the Atlantic, a distance of 660 feet, and in front of its outer end a breakwater 225 feet long and 50 feet wide. The breakwater is to consist of three lines of iron piling so interlaced with chain work as to form a sort of sieve, through which the first breakers are expected to pass, losing their force thereby, and their power to damage the boats made fast to the pier. The cost of the sea wall (to protect the cliff), the pier, and the breakwater, is estimated at $200,-000. The sea wall is already finished. Work on the pier was begun February 4th, and it is expected that the entire structure will be completed in time for the summer's demands. The pier is to be formed of three lines of tubular iron piles, strongly interlaced with iron girders, the deck to rise fifteen feet above high water. As the sea bottom is sand, the sinking of the piles is an easy matter. The method adopted for sinking them is as simple as it is effective. At the lower end of each pile is placed a "shoe" shaped like a sugar loaf, and having in its point an inch hole. The pile being held in position by ropes, a stream of water is forced through it by a steam engine or a float, the water cutting away the sand and allowing the pile to sink.

The first result of the improvement will be to make the trip to Long Branch a delightful sail, costing less than half the amount hitherto charged. This, in addition to the attractions of the place, is counted on to divert to it a considerable share of the patronage secured by Coney Island last summer, a patronage rising as high as 70,000 visitors a day.—*The American Ship.*

* San Francisco *Spirit of the Times.*

PHOTOGRAPHY IN MEDICINE AND SURGERY—INTERESTING SPECIMENS FROM BELLEVUE HOSPITAL—PHOTOGRAPHING AN IDIOT—SURGICAL PREJUDICES OVERCOME—PHOTOGRAPHING IN COLORS ALMOST AN ACCOMPLISHED FACT—A VALUABLE NEW DISH FOR THE LABORATORY.

At the monthly meeting of the Photographic Section of the American Institute held at Cooper Union March 4th, the secretary, Mr. O. G. Mason, official photographer to Bellevue Hospital, exhibited a new dish for chemical and photographic purposes. It is made of sheet-iron, coated with a glaze which is proof against the action of acids and alkalies. Hitherto the kind of dish in general use has been one imported from Berlin, and costing $10; whilst the new dish, besides its advantages in other respects, will cost less than half that price. A porcelain or glass dish will break, but this will not; it is much lighter than a cast-iron dish lined with porcelain, besides that in such a dish the porcelain would eventually crack and chip off.

Mr. Newberry exhibited photographic portraits in permanent colors executed by his daughter, Mrs. Annie Thomas, who received a medal from the American Institute in 1863. They were paintings in oil done on a photographic basis. Mr. Mason exhibited an interesting package of portraits of important medical and surgical cases which presented themselves in the hospital practice. These portraits showed how photography is used to illustrate diseases, a comparatively recent but very valuable application of the art. Among the pictures was one of a lady who came to Bellevue Hospital with her lip cut by the kick of a horse, and another showing the same lady with the wound in her lip partially healed. One of the most remarkable portraits in the collection was that of John Rouse, said to be the most celebrated idiot in America, if not in existence. A word or two may here be said *en passant* about the original of this portrait. Poor John Rouse is an inmate of the lunatic asylum on Ward's Island, and the stupidest idiot our Commissioners of Charities and Corrections have ever had to deal with. He is as harmless as a child, but seems to have no intelligence whatever. Though he has the organs of speech all perfect, he cannot speak; the most that the utmost training through a long series of years has been able to do for him is to enable him to utter one or two sounds. He is thirty-eight or forty years of age, and is invariably pointed out to visitors as one of the most phenomenal cases on record. It was a most difficult task to get a picture of him, as he could scarcely be made to keep quiet for a single instant.

When, ten years ago, the idea that photography could be made serviceable in connection with medicine and surgery first presented itself, only three surgeons of the Bellevue Hospital staff could be found in its favor. These three had their most important cases photographed when received and when discharged. In a few years other surgeons saw the advantages resulting from the practice and followed

the example; and so on from year to year until finally the men who most opposed the innovation originally became its best supporters and patrons. Photography in connection with surgical operations shows the appliances used, the method of applying splints, the form of cuts in amputating limbs, the form of tumors and of cuts in removing tumors, etc. The practice has been to take three pictures of each ease; one for the visiting surgeon, one for the house-surgeon, and one for file on the history books of the hospital.

Not only astronomers, said Mr. Mason, but surgeons and all scientific men are now more or less dependent on photography to let others know what they are doing.

Mr. E. C. Chapman remarked that while photography does not lie, it does not tell all the truth. While it shows form, it does not show color, and gives no idea of the character of wounds as to their degrees of aggravation. If it could do that, it would, so far as surgery is concerned, be perfect.

Mr. Newberry said he was at present experimenting, and hoped soon to be able to print any thing in color.

Dr. Newton: "That is exactly what we and everybody want."

The meeting then adjourned for one month.

Progress in Sciences and Arts.

The Comparative cost of the Electric Light forms one of the topics in the report of Mr. George Deacon, the Engineer of the Liverpool Town Council, who has been engaged in the investigation of methods of street lighting under the direction of that body. He asserts that while the statements regarding the relative cost of electric lighting and gas lighting are true, the inferences which have been based upon them are misleading.

Economy in electric lighting cannot be secured wth light of less than 1000 candle power, the economy increasing when the illuminating power is increased. He concludes that, in terms of area lighted, the Jablochkoff light costs twenty-one times as much as gas.

Chlorophyl as a Coloring for Articles of Food is said to have been successfuly applied by M. Guillemare, Professor of Chemistry, and M. Lecourt, manufacturer of conserves, at Paris. After many experiments these gentlemen have succeeded in definitely fixing "chlorophyl" on vegetables by adding it to that which they naturally possess, thus preserving the green color which otherwise would be destroyed by ebullition—an operation which is necessary to insure preservation. Besides its simplicity, this process presents the immense advantage, of not introducing any injurious agent into the preserved vegetables, as the products employed enter into one's daily food. Consumers may thus place on the table, in the middle of winter, wthout fear of injury to health, or extra expense, vegetables admirably green and of excellent taste. The Académie de Sciences of Paris has reported most favorably on the process; and vegetables treated with chlorophyl have been analyzed by several English chemists with equally favorable results. Dr. Saunders, public analyst for the city, having examined samples, writes: "The peas had a green color and a good flavor. They were entirely free from copper or anything that would be injurious to the health of those using them as an article of food. We consider the new process of coloring preserved vegetables a very important one, a great improvement on anything brought out before, and its success is exceedingly satisfactory." The nature of the process has not been made public.

Studio Glue.—"Every one," writes a contributor to the *Photographic News*, "knows what a nuisance it is to 'heat the glue-pot' when some small mend has to be made. And most people also know that all substitutes for glue are more or less failures for wood work of all kinds; and indeed for most kinds of soft substances there is no cement that is so thoroughly satisfactory as glue. I have found an exceedingly simple way of using glue for small mends. This is the method: Put a pinch of Neison's shredded gelatine into a wide-mouthed bottle; put on it a very little water, and about one fourth part of glacial acetic acid; put in a well-fitting cork. If the right quantity of water and acid be put, the gelatine will swell up into worm-like pieces, quite elastic, but at the same time firm enough to be handled comfortably. The acid will make the preparation 'keep' indefinitely. When required for use, take a small fragment of the swelled gelatine and warm the end of it in the flame of a match or candle; it will immediatey 'run' into a fine clear glue, which can be applied at once direct to the article to be mended. The thing is done in half a minute, and is, moreover, done well, for the gelatine so treated makes the finest glue that can be bad."

For our own part, we should fear the result of the direct action of heat upon the glue used as recommended. However, the experiment is easily and cheaply tried, and it will be easy to demonstrate the value of the recipe.

A New Product of Petroleum, or, more properly speaking, petroleum compound, stated to be *saponified petroleum* (?), is described in the *New York Paint and Drug Reporter*, which says the specimens "were in different forms—emulsion, paste, and cake. These, upon inspection, appeared to be perfect specimens of saponification, and we were assured that no oleaginous matter, except petroleum oil, was introduced in their composition. These seemed to be a practical contradiction of the theory that petroleum oil cannot be saponified in the very nature of things. Such has been our impression, not from actual experiment, but based upon the statement of experts, who insist that petroleum can be rendered miscible only, and we know that it has been tested by various parties with great care and persistence. We confess our incredulity in the matter, but it is not safe in these days of discovery to doubt the solution of any scientific problem, and we can only say that we hope the enthusiastic author of this long-sought consummation is not deceiving himself. They are claimed to be applicable to the purposes of scouring and finishing in textile manufactures, to domestic and toilet articles, and, by reason of their antiseptic and healing properties, to medicinal preparations."

The specimens showed to our contemporary were probably mixtures of what is known to oil men as "B. S.," and ordinary soap. "B. S." is a solid, or partially solid, deposit from crude petroleum. A similar mixture was once shown to the writer, and it was well calculated to deceive.

A Supposed Advantage of the Electric Light was that, giving out neither carbonic acid nor sulphurous acid, it would not damage gilding, books, furniture, etc. The discovery has been made, however, that the intense heat of the electric arc causes the oxygen and nitrogen of the air to combine, and produces nitric acid—a far more destruetive agent than carbonic acid. It is stated that an electric light will produce at least ten grains of this acid per hour.

Minute Organisms.—Animalcules exist so minute that *myriads* can swim in a drop of water, and yet every individual posseses organs of digestion, circulation, and reproduction. The polishing slate from Bilin, in Bohemia, composed almost entirely of siliceous shells of infusoria, has been calculated to contain 41,000,000,000 (forty-one billions) in a cubic inch, which weighs 220 grains; consequently each shell, possessing, nevertheless, the most exquisite beauty of structure, would weigh little more than the *two hundred-millionth part of a grain*.

To Detect Adulteration of Olive Oil with other fatty oils, Poutet proposes the following process: A nitrate of mercury is first prepared by dissolving 6 parts of mercury in $7\frac{1}{2}$ parts of nitric acid at 38°—46° Baumé in the cold. Next 96 parts of the oil in question are mixed with eight parts of the nitrate of mercury thus obtained, and shaken every ten minutes for two hours. After standing for twelve hours the elaidine which has been formed will appear pale yellow and perfectly solid if the oil is pure, but if adulterated the elaidine will be orange or dark red, and only partially or not at all solid. To detect a sophistication of olive oil with the oil of sesame, two parts of the sample in question, at a temperature of 68°—77° Fahr. are shaken up with one part of pure muriatic acid at 22° Baumé, in which about one-tenth of a grain of sugar has been previously dissolved. After standing for a short time, the oil separates from the acid, and if sesame is present, takes a rose color, more or less deep, according to the quantity of the impurity.—*Neue Wochenschrift für Oelhandel.*

Distinguishing the Diamond.—M. Babinet, of the French Academy, gives the following test for distinguishing colorless gems from diamonds: If a person looks through a transparent stone at any small object, such as the point of a needle, or a little hole in a card, and sees two small points or two small holes, the stone is not a diamond. All white colorless gems, with the exception of the diamond, make the object examined appear double; in other words, double refraction, whenever exhibited by a stone, is proof conclusive that it is not a diamond.

Hog Cholera Remedy.—The Lewiston *Gazette* positively asserts that burnt corn is a certain and speedy cure for hog cholera. It says the best way is to make a pile of corn on the cobs, effectually scorch it, and then give the affected hogs free access to it. This remedy was discovered by E. E. Locke, the proprietor of a distillery which was burnt with a large lot of store corn, which was so much injured as to be unfit for use, and was hauled out and greedily eaten by the hogs, several of which were dying daily. After the second day not a single hog was lost, and the disease entirely disappeared. The remedy has been tried in a number of cases since, and never failed.

An Improvement in Ventilation is ascribed to Doctor John Swinburne, of Albany, formerly Health Officer of the Port of New York. It is perfectly scientific in principle, and has been applied to the Children's Hospital at Albany. The method consists simply in having large window-spaces and filling nearly two thirds of each with properly arranged frames, on which is fastened ordinary, rather thin, unbleached muslin. The frames are so arranged as to slide, and when it is very cold three thicknesses of cotton cloth, two or three inches apart, can be brought into the window-space. The wards run east and west, and are fully exposed to the north, north-east and east winds, and partially to the north-west. The rains beat on the cloth. One third of each window is occupied by glass. It is said that the temperature in the wards is easily regulated, and that the quality of the air is always good.

A Rare Meteorological Phenomenon has been observed in Switzerland. While the temperature in the valleys and plains has been low, the waters covered with ice, and snow resting on the ground, a warm south wind has prevailed in the uplands and among the higher Alps, where the streams remain unfrozen, and the snow has almost disappeared. This has been especially the case in Uri, Schwytz, the Grisons, Neufchâtel, and the Bernese Oberland.

Grindstones.

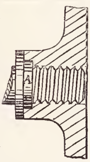
I promised in my first paper to treat of the most indispensable of all machine tools. And what can disable a machine-shop more effectually than to destroy the *grindstone?* Unless the loss were supplied by the modern substitute, the emery grinder, to destroy the grindstone would be to wreck the shop. A thorough study of the subject will develop more requirements than many think, and much ingenuity or skill in designing might be displayed in working out the problem. It should be strong, simple, and clean; the trough expanded to catch as much as possible of the drip water and grit; a movable shield securely hinged to keep the water from splashing, and yet permit the stone to be used from either side; rests provided upon which to rest tools and the rod for turning the stone, these rests being arranged to move towards the centre as the stone wears smaller. The bearings should be generous in size, proper provisions being made for oiling without washing the grit into the bearings with the oil, and the ends of the bearings being protected by some device which effectually prevents the entrance of the grit. The stone should be secured to the shaft by nuts and washers, and the washers fixed so that they cannot turn with the nuts as they are screwed up or unscrewed. In hanging the stone, great care should be taken to hang it true sidewise, not only for convenience in using, but because a stone that is not true sidewise can never be kept true edgewise.

Suppose a stone to run one fourth of an inch out of true sidewise, and while in motion draw a line around it within three eighths of an inch from the edge, on an average. From this line there would be but one fourth of an inch of stone on one side and one half on the other. If you had a stone only this in thickness—that is, a stone one fourth of an inch thick on one side and one half of an inch thick on the other—would not the one fourth-inch side wear away faster than the other? That is exactly what it does on that side of the thick stone, only the thicker the stone and the less it is out of truth the less it wears.

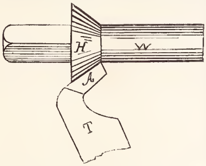
In using a stone, the best grinders of edge tools have it run towards them. A beginner can generally do better with the stone turning from him ; but as you want to learn the best way, practise with the stone turning towards you, and you will soon get accustomed to it, and will then like it best. In turning a stone—that is, in truing one up when first set, or when out of round—a small iron or steel rod is better than a large one. The best size for the rod depends upon the size, or rather upon the power by which the stone is driven. The larger a stone and the more powerfully it is driven, the larger the rod can be. The reason why a small rod is better than a large one is because, as the rod is ground away, at the upper corner, a sharp one is formed at the bottom, and rolling the rod constantly presents a new cutting edge.—*Professor Sweet, in Polytechnic Review.*

Shop and House Hints.

Running Chuck True.—To insure that a chuck shall run true notwithstanding the wear of the thread, the spindle should have a plain part, A in the figure, which may be slightly tapered, but must fit the chuck when the latter is screwed home. In this way the thread of the chuck is not depended upon to keep it true.



Turning Patch-Bolts.—To save fitting each patch-bolt to its place, it is a good plan to turn all the stems of the bolts first, and then finish all the taper heads with a tool shown in the figure, in which W is the work and T the tool adjusted to its proper angle, and having the face A at an angle when used upon iron or steel, but not when used upon brass.



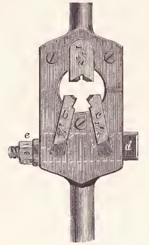
Etching on Copper.—S. M. inquires whether there is any known liquid which possesses magnetic properties. *Ans.* Solutions of iron, cobalt, and of gold, alcohol, and other liquids, distinctly exhibit magnetic effects when placed near the poles of a powerful electro-magnet. This correspondent asks also for directions for etching on copper. *Ans.* The surface of the copper to be etched should be first coated with beeswax, which can be done by heating the metal till the wax will melt and flow over it. The design to be etched should be next engraved or cut through the wax after the latter has solidified. The lines or figures thus cut in the wax may now be bitten in to the metal by nitric acid, diluted with water in the proportion of ten parts, by weight, of water to every four parts of strong commercial acid.

Water-Pipe.—H. A. S. wishes to know dimensions of a tapering pipe ample to deliver 100 lbs. of water per minute under fifty feet head, and a horizontal distance of 50 rods, to drive a small motor. *Ans.* Without entering into the utmost refinement of calculation, we reply, that commencing the pipe with a diameter of one inch, and ending with one quarter-inch internal diameter, the delivery will be ample, with a uniform taper. A smaller diameter at the lowest part of the pipe would answer, but it is best not to work down to the extreme limit. The friction in such a pipe will be considerable, and allowance must be made for it.

Electric Bell for Incubators.—J. J. D. and others ask if an electric bell arrangement can be employed to indicate when the temperature in an incubator or other heated apartment rises too high, and whether such an apparatus is now in market. *Ans.* We are not aware that such an apparatus is in market, but it would be easy to make one. All that would be necessary would be to make an adjustable insulated metallic rod a part of the circuit, and set it at such a distance from a metallic point also in the circuit that, when the maximum temperature desired is reached, the closing of the circuit would be effected by the expansion of the rod, and to place an ordinary bell-ringing arrangement also in the circuit. The bell would, of course, ring whenever the circuit was closed. A mercury column, in a glass tube, forming a part of the circuit, would be a good substitute for the expanding rod. Apparatus of this kind has been the subject of a number of patents. One of these is an electro-magnetic thermometer invented by Geo. M. Sternberg, and patented October 31, 1871.

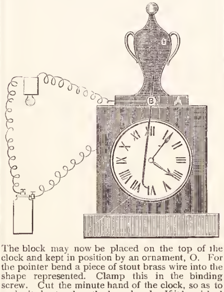
Fixing Crayon Drawings.—J. C. M. wishes the best method for the above. We believe the best method to be what is called the atomizing process, referred to by Dr. Vanderweyde, in his remarks upon Darwinism published in a recent issue of the SCIENTIFIC NEWS, as the method of fixing the portraits in the comparitive series used by him as illustrations of gradual development. By his courtesy we are informed that this consists in treating the faces (not the backs) of the drawings with the mist or spray of a solution of white shellac in alcohol, the instrument for applying the solution being any ordinary atomizer, such as is used for perfumes. Care is necessary to apply the atomized solution uniformly, and not in such quantity as to form drops upon the surface. One going over is sufficient.

Whitworth's Stock and Dies.—The accompanying illustration represents Sir Joseph Whitworth's stock and dies, the top plate or cap being removed to show the arrangement of the parts ; *a* is a stationary die, while *b* and *c* are two chasers whose conical ends project into conical notches in the taper key, *d*, hence, by screwing up the nut, *e*, *d* is drawn through the stock and forces *b c* inwards to put on the cut. Thus *a* acts as a guide to



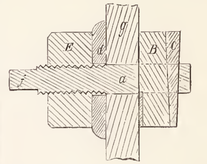
steady the work. To enable the dies to cut when revolved either way, the cutting edges of *b c* face each other as shown in the cut, so that when revolving one way *b* cuts, while when revolved back *c* operates. It will be observed that *b* and *c* can be ground up to sharpen them. It will also be observed that *b* and *c* stand radially so that in closing they approach the centre in a direct line.

Simple Electric Alarm Attachment for Clocks.—All that is necessary to transform any common clock into an alarm in connection with an electric bell is to connect one pole of the battery with the works of the clock (by attaching the wire to one of the screws connected therewith), and the wire from the other pole (having the bell attached) to a movable pointer, whose extremity is capable of different positions on the dial. The first point is easy enough. To accomplish the second : take a flat piece of mahogany or deal, the size of the top of your clock and about ½ in. thick ; into the side of this piece of wood, A, fix a binding screw, B. To the base of the binding screw (B) attach the wire from the bell, and fasten it to block A.



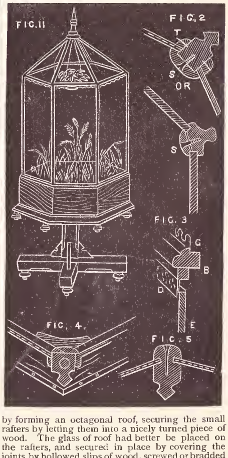
The block may now be placed on the top of the clock and kept in position by an ornament, O. For the pointer bend a piece of stout brass wire into the shape represented. Clamp this in the binding screw. Cut the minute hand of the clock, so as to make it shorter than the hour hand. If it be wished to have the alarm sound, say at six, clamp the pointer so that the point will be touched as the *hour* hand comes round to six o'clock. Communication between the poles will thus be effected, and the bell will ring.

Hand-Facing Tool.—In the accompanying cut is shown a handy tool for facing off a surface around a hole that cannot be got at by a drilling-machine. *a* is a steel pin slotted to receive the cutter B, which is locked by the key C. *d* is a washer and



E a nut. A is square at *f* to receive a wrench. *g* representing the work. A is passed through the hole, and *d* is then inserted and keyed up ; *d* and E are then put on, the latter pressing B to its cut ; *a* is rotated and faces the surface of *g*.

Easily Constructed Fern Case.—One of the prettiest of easily obtained household adornments is a case of thrifty, tastefully grouped ferns and woodland mosses. We give in the accompanying engraving an illustration of the construction of such a case, which any of our readers having very moderate mechanical skill may make at small expense. Form a bottom of inch board, with strong ledges beneath, cross-way of grain at bottom. Make it hexagonal or octagonal in shape, of about 2 ft. diameter. Form round it a framework, 9 in. high, of good ¾ pine ; across the bottom, inside, cross-way of grain, place two strips of inch deal, leaving a space between them of the same size as the width of one of the sides of the framework. This is to form room for a zinc drawer, to slide in to catch drainage. Get a tinman to line the box thus made with good zinc, which will rest on the two pieces of inch wood, and stand as high as the top edge of the box. Pierce, from above, several holes in the zinc to serve for draining the soil of the case, and be sure that they are placed over the drawer, which is to slide beneath. Now form two frames, hexagonal or octagonal, of stuff (pine), 2 in. wide—one to stand at the top of box ¾ in. thick, the other at top of case ½ in. thick. Strengthen the angles by pieces cut as in engraving, fig 4. Cut 8 uprights from ¾ stuff 2 ft. long ; fig. 2 is a section of these. The strip marked S should be bradded on with brass brads ; as also the pieces marked T T, which serve to hold in the glass. Furnish the top



by forming an octagonal roof, securing the small rafters by letting them into a nicely turned piece of wood. The glass of roof had better be placed on the rafters, and secured in place by covering the joints by hollowed slips of wood, screwed or bradded to the rafters. Fig. 5 is a section of this. The bottom frame may be strengthened by fastening round it, by means of screws, a narrow strip of hooping. The glass sides should not be taken quite up to

the upper frame, but a space of about ½ in. left for ventilation—this space is concealed by a strip of ornamental zinc which passes round the top frame, both above and below. A portion of one of the sides of the octagonal or hexagonal box, with its accompanying moulding, must be cut off to form the front of the drawer to catch the drainage. Fig. 1 gives a rough idea of the case when put together and stocked. Fig. 2 gives a section of two forms of uprights to hold the glass. One of the sides of the case had better be made to take out, so as to afford facility of getting at the plants. This may be arranged by putting round the glass a light framework of wood, neatly fitting between the two uprights. Fig. 3 is a section of the top framework, showing the zinc used as ornament. Fig. 4 is the bottom of frame (one angle) showing the shape and position of upright, and of the strengthening piece. Fig. 5 is section of roof-bar, showing the manner of fixing the glass. The part above the box is made to take off for the purpose of getting freely at the plants. Its proper position should be secured by a few sticks inserted in the sides of the box, and entering holes in the framework containing the glass. Secure it by two or three neat brass hooks and eyes on the outside. Paint the zinc a dark red, and stain the woodwork with light oak stain. Varnish all wood and zinc.

Book Notices.

A Treatise on the Horse and his Diseases; Containing an "Index of Diseases," which gives the Symptoms, Cause, and the Best Treatment of Each; a Table giving all the Principal Drugs used for the Horse, with the Ordinary Dose, Effects, and Antidote when a Poison; a Table with an Engraving of the Horse's Teeth at Different Ages, with Rules for telling the Age of the Horse; a Valuable Collection of Receipts, and much other Valuable Information. By B. J. Rendall, M.D., Enosburgh Falls, Vt. Illustrated by H. W. and E. Herrick, Manchester, N. H. Claremont, N. H.: The Claremont Mfg. Co., Printers and Publishers.

We unqualifiedly commend this publication. It is intended to place in the hands of the general public, in a cheap form, reliable information, so expressed that even the unprofessional reader may readily comprehend and intelligently apply it. A most characteristic feature of the work is the style of illustration, which exhibits the appearance of the horse in the different stages of disease, more especially in the first stages. These cuts are very striking in the truth with which they portray the symptoms of the various complaints described, and are specially valuable to the inexperienced and unprofessional reader. The general and careful perusal of the book, and judicious application of the instruction it imparts, would greatly ameliorate the condition of the horse—the most useful yet most abused of all domestic animals.

The Strength of Materials. By William Kent, M.E. Reprinted from *Van Nostrand's Magazine*. New York: D. Van Nostrand, Publisher, 23 Murray and 27 Warren streets. 1879.

No. 41 of "Van Nostrand's Science Series." It is a reprint of a series of valuable articles upon the strength of materials published in Vol. 20 of *Van Nostrand's Engineering Magazine*. Like most people who enter thoroughly into the subject, the author became astonished to know how little is generally known about the proper methods of testing. The object of the author, as expressed in his preface, is to aid in diffusing correct information. A quite cursory examination of the book convinces us that it is written by an engineer who has given much time and attention to this most important department of constructive science, and who is qualified to speak as one having authority. It is fast becoming the opinion of engineers that tables of strength will not avail for most economical application of materials to construction. Either a very large factor of safety must be allowed in all cases or special tests of materials employed must become the rule. We think a perusal of this essay will convince candid readers that the latter course is not only the most scientific, but also most safe and economical.

A New Theory of Life and Species. Published by J. B. Pool, West Pittsfield, Mass.

This is a pamphlet which not only adopts and reasserts the development theory of creation, but also avows belief in the immortality of all living things, animals or plants, the immortality consisting in a spiritual life after the cessation of the present state of existence. This essay will be interesting to most speculators upon the mysteries of existence, and especially to spiritualists. Its price is 15 cents, and it may be had of the author.

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In connection with the publication of the Scientific News, we make it a part of our business to secure patents in the United States, Canada, Great Britain, France, Germany, Belgium, Austria, Russia, Italy, and other countries. Caveats filed, Designs patented, Trade-marks and Labels registered, Rejected Cases prosecuted, Re-issues obtained, Interferences managed, Assignments and Licenses prepared.

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The New York *Sun*, of Oct. 22d, 1875, published in its editorial columns the following: "When Mr. Wales was one of the editors of the *Scientific American*, and was devoting his energies and his mechanical knowledge to the development of the inventive genius of our people, he organized an admirable system for the obtaining of patents, classifying the various inventions according to the essential principles upon which they were based, and the uses to which it was sought to adapt them."

These testimonials could be multiplied if necessary. We repeat that our cases will be carefully prepared and vigorously prosecuted, and at hard times prices. We will do good work, and charge very moderately for it. We shall be glad to receive inventors at our office, or to correspond with them by mail.

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PATENTS IN GREAT BRITAIN.

The patent covers England, Scotland, Ireland, the Channel Islands, and the Isle of Man, but not any of the colonies. Several improvements may be included in one patent, if they relate to one particular manufacture.

Letters-Patent are granted to the first inventor, discoverer, or importer of any new invention or improvement in the industrial arts or manufactures, for a period of fourteen years.

It is important, therefore, to select a well-known and reliable solicitor, as upon his reputation and experience will largely depend the character of the patent.

Our charge for securing a British patent will rarely ever exceed $225.

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Under the new German Imperial Patent Law, passed July 1st, 1877, a patent can be secured for the whole German Empire, comprising Prussia, Bavaria, Saxony, Wurtemberg, Hanover, Alsace-Lorraine, and twenty-one principalities and free towns, having an aggregate population of 43,000,000. Patents are granted for fifteen years, subject, however, to the payment of a small yearly tax. Our charge for application for a German patent is from $80 to $90. An examination is made as to the novelty of the invention.

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PATENTS IN FRANCE.

France is one of the largest manufacturing countries in Europe, having a population of over 40,000,000. The patent system is liberal, but no one but the inventor is entitled to apply for a patent, which is granted for fifteen years, subject, however, to an annual tax of $20. The patentee is allowed two years within which to work his invention. Cost of patent, from $70 to $100.

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FOREIGN PATENTS.

Through our various agencies we secure patents in Russia, Italy, Austria, Denmark, Norway, Sweden, Brazil, Victoria, New South Wales, Queensland, South Australia, Western Australia, Cape of Good Hope, British Guiana, Ceylon, India, Jamaica, Mauritius, Natal, New Zealand, Tasmania, Trinidad.

Holland, Switzerland, Greece, and Turkey have no patent laws, but seem content to travel by slow conveyance.

The lowest estimate of costs of the above will be given on application to

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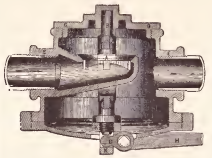
India Ink of a deep black, which gives neutral tints for half shades, is very rare. It may be made as follows: Rub thoroughly together eight parts lamp-black, sixty-four parts water, and four parts of finely pulverized indigo. Boil until most of the water is evaporated, then add five parts gum-arabic, two parts glue, and one part extract of chicory. Boil the mass again till it is thickened to a paste; then shape it in wooden moulds which are rubbed with olive or almond oil.

PRESSURE REDUCER AND REGULATOR.



This apparatus is designed to regulate the pressure and escape of steam, compressed air, gas, or water, to any desired flow from the generator, or from one set of pipes to another, to maintain a continuous lower pressure. It is especially adapted to heating purposes on railroads, or in buildings where the pressure on locomotives or elevator engines is in excess of that suitable for heater coils, thereby endangering the joints and fittings. It may also be employed to advantage in sugar-houses, where a uniform pressure and temperature are required in the vacuum pans; also in distilling oils or spirits, in drying-rooms of bleacheries, dye-houses, paper-machines, or for any and all purposes where a uniform and constant pressure is required.
Manufactured by HANDREN & RIPLEY, at their Engine and Boiler Works, No. 126 Washington Street, New York.